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BULLETIN
OF THE
TORREY BOTANICAL CLUB

APRIL, 1919

New species of Uredineae—XI*

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The preceding number in this series† was issued in April, 1918. Studies since that time have shown that two species given there were founded upon a misinterpretation of the hosts. The material submitted by the collector for *Puccinia wyomensis* (Bull. Torrey Club 45: 143) consisted of three culms of *Scirpus americanus*, two of them fertile. These were about a foot long, once folded, and were intermixed with two fragments of culms and about twenty pieces of leaves averaging six inches long, having a similar appearance. Not until after publication was it ascertained that the material was separable into culms of *Scirpus* and leaves of what is undoubtedly an *Agropyron*. The rust is wholly on the *Agropyron*, although the *Scirpus* is discolored and wrinkled in a way to simulate the grass leaves. The rust proves to be *Puccinia Clematidis* (DC.) Lagerh., of which *P. wyomensis* thus becomes a synonym. Recently the collector has distributed (Barth. N. Am. Ured. 1999) what purports to be the type collection of this form, but which wholly consists, so far as the specimen coming to the writer shows, of *Puccinia oblecta* Peck, on *Scirpus americanus*.

* Reprints may be obtained by application to the Botanical Department, Purdue University Agricultural Experiment Station, Lafayette, Indiana, under whose auspices the studies here reported were largely carried out.

† New species of Uredineae I-X: Bull. Torrey Club (I) 28: 661-666. 1901; (II) 29: 227-231. 1902; (III) 32: 1-8. 1904; (IV) 33: 27-32. 1906; (V) 33: 513-522. 1906; (VI) 34: 583-592. 1907; (VII) 37: 569-580. 1910; (VIII) 38: 369-378. 1911; (IX) 42: 585-593. 1915; (X) 45: 141-156. 1918.

[The BULLETIN for March (46: 73-106, pl. 6, 7) was issued March 10, 1919.]

A somewhat similar error occurs in connection with *Puccinia missouriensis* (l. c. p. 146). In making studies for the genus *Allodus*, Professor C. R. Orton made the discovery that the host, consisting of a small fragment, 2 by 3-5 cm., is not *Ranunculus recurvatus* as stated by the collector, but is in reality *Anemone cylindrica* A. Gray, and that the telia on it belong to *Puccinia Anemones-virginianae* Schw., while the aecia belong to *P. Clematidis* (DC.) Lagerh.

A number of grass rusts, now known only in their uredinial form, undoubtedly belong either to the genus *Puccinia* or *Uromyces*. For the sake of convenience in listing such species it is proposed to transfer two of these names without waiting for the discovery of the telial form. They will be placed under *Puccinia*, as the chances are two out of three that they will eventually be found to belong in that genus rather than in *Uromyces*. In the case of three other species of grass rusts long known under the genus *Uredo* the teliospores have recently been discovered and, in the case of two of them, on type material, entitling them to a place under *Puccinia*.

The wholly new species here proposed, some sixteen in all, are partly taken from recent collections, but more largely from material which has been long in the herbarium awaiting study. While a few of these came from the northern states, they are largely from the southern border of the United States, from Mexico and the West Indies. I have been given the privilege to include species derived from the studies of Professors Jackson, Holway and Bethel, which with others here published are shortly to be made part of the seventh volume of the North American Flora.

***Puccinia egressa* nom. nov.**

Puccinia egregia Arth. Bull. Torrey Club 38: 370. 1911. Not *P. egregia* Arth. 1905.

Through pure inadvertance the same specific name has been given by the writer to two unrelated rusts. The first opportunity since noticing the mishap is now taken to replace the later one, the species being on *Baccharis oaxacana* Greenm., still only known from the type collection made on Mt. Oaxaca, Mexico, by C. G. Pringle, in 1894.

***Puccinia* (?) *fuirenicola* nom. nov.**

Uredo Fuirenae P. Henn. Hedwigia **38**: Beibl. [70.] 1899. Not *Puccinia Fuirenae* Cooke, 1878.

The type of this species was collected at St. Catherine near San Francisco, Brazil, in 1884, by E. Ule, No. 15. It is on *Fuirena umbellata*, the same species of host on which it occurs in Cuba, Porto Rico, and India. The author of the species so named it because he thought it probably a form of *Puccinia Fuirenae* Cooke, whose uredinia had not then been described. The urediniospores differ decidedly, however, from those of that species in size, thickness of wall, and number of pores. Teliospores are not known.

***Puccinia* (?) *Scribnerianum* nom. nov.**

Uromyces Aristidae Ellis & Ev. Jour. Myc. **3**: 56. 1887. Not *U. Aristidae* of later authors, or *Puccinia Aristidae* Tracy.

Only the type collection of this species is known. It shows prominent sori with large, thick-walled urediniospores and strongly developed paraphyses. The type specimen in the Ellis Herbarium at the New York Botanical Garden is labelled "*Uromyces Aristidae* Ellis & Ev. on leaves of *Aristida Arizonica* Vasey, New Mexico." Within the packet is a note indicating that the material was communicated by Prof. Scribner: "The *Uromyces Aristidae* I found on the lvs. of an herbarium specimen of the *Aristida* from New Mexico. I send you half of the material I found. F. L. Scribner." A fragment of the same collection is in the Farlow Herbarium at Harvard University, communicated by J. B. Ellis, which gives the locality as "Arizona" instead of New Mexico. Parts of these two specimens were transmitted to Professor A. S. Hitchcock at Washington, D. C., with the request that he look over the grass herbarium to see if the host could be matched or verified. He replied under date of November 3, 1913: "I have looked over the specimens of *Aristida arizonica* [in the National Herbarium], and I find one collected in New Mexico in 1884 upon which there is a rust apparently the same, so far as external appearances go, as the one on your specimens. This sheet [No. 745514] was formerly a part of the Scribner Herbarium, recently acquired by the National Herbarium. It is true that your specimen is said to have come from Arizona, and the published locality of the

[phanerogamic] specimen is Arizona, yet all the specimens in our herbarium upon which Dr. Vasey left a record, many of them with numerous notes and descriptions, are from New Mexico, and what I regard as the type of the species in spite of the published locality is from New Mexico." Professor Hitchcock kindly sent a portion of the rusted leaves from the phanerogamic specimen, which proved to be identical in microscopic characters with the Ellis specimen. It is clearly evident that only one collection of the rust is known, partly in the Ellis collection in New York, partly in the Farlow Herbarium at Cambridge, and partly in the National Herbarium at Washington, which was collected by Dr. George Vasey at Santa Fe, New Mexico, in 1884, and communicated to Mr. Ellis by F. L. Scribner. The dark color of the spores must have led Mr. Ellis to call it *Uromyces*, thinking he had telia rather than uredinia. No trace of teliospores has yet been discovered.

The species of *Uromyces*, which had been commonly called *U. Aristidae*, having urediniospores unlike those of the present species, and with teliospores usually present, was named *U. seditiosus* by Dr. F. D. Kern (Torreya 11:212. 1911), who pointed out the peculiar situation regarding the Ellis material. Again it seems desirable to explain the chain of circumstances making it necessary to give a new name to this imperfectly but long recognized rust. Although the teliospores are not known it will be placed under the genus *Puccinia* for convenience in listing.

***Puccinia Kaernbachii* (P. Henn.) comb. nov.**

Uredo Kaernbachii P. Henn. Bot. Jahrb. 18: Beibl. [22]. 1894.

II. Uredinia hypophyllous, numerous, in lines, often confluent, elliptic, 0.5–1.3 mm. in length, long covered by epidermis, chestnut-brown; paraphyses peripheral, usually erect, clavate-capitate, 15–18 by 32–55 μ , the wall pale cinnamon-brown, 2–2.5 μ thick, thicker above, 7–10 μ ; urediniospores broadly ellipsoid or obovoid, 18–24 by 26–32 μ ; wall chestnut-brown, 1.5–2 μ thick, uniformly, finely and closely echinulate, the pores usually 4, equatorial.

III. Telia similar to uredinia; teliospores oblong or oblong-ellipsoid, 16–19 by 35–48 μ , usually rounded above and below, moderately constricted at septum; wall chestnut-brown, 1–2 μ thick, thicker above, 5–7 μ , smooth; pedicel concolorous, fragile.

On *Andropogon stolonifer* (Nash) Hitchc., Brevard County, Florida, October 16, 1903, A. Fredholm 6122; Hillsborough

County, Florida, September 27, 1904, *A. Fredholm* 6406. Both collections were communicated in the spring of 1917 by Mrs. Agnes Chase, who separated them from specimens in the grass herbarium of the U. S. National Herbarium.

Andropogon stolonifer is closely related to *A. scoparius* Michx., differentiated from it chiefly by having well-developed stolons. The two belong to the genus section *Schizachyrium*, while *A. Schoenanthus* L., the host of Hennings' *Uredo Kaernbachii*, belongs to the section *Cymbopogon*. It is the opinion of Mrs. Chase that the plant intended by "*A. Schoenanthus*" may be one of the oil grasses that passed under that name. However, Stapf has shown that the true *A. Schoenanthus* is the desert grass called *A. laniger* Desv.

***Puccinia pallescens* nom. nov.**

Uredo pallida Diet. & Holw.; Holway, Bot. Gaz. 24: 37. 1897.

Not *Puccinia pallida* Tracy, 1893.

II. Uredinia amphigenous, oval or oblong, pale yellowish; paraphyses none; urediniospores ellipsoid, obovoid or pyriform, 13-21 by 20-29 μ ; wall colorless or nearly so, thin, about 1 μ , finely and moderately echinulate, the pores equatorial, very indistinct, probably 4.

III. Telia hypophyllous, scattered or associated in rather indefinite groups about 1 cm. across, oval or oblong 0.5-2 mm. long, covered by the epidermis, very compact and stromatoid, brownish-black due partly to discoloring of surrounding host tissue; teliospores cylindric, 1-4-celled, usually 2- or 3-celled, 9-16 by 26-67 μ , truncate or rounded at both ends, slightly or not constricted at septum; wall light golden-brown, thin, 1 μ , slightly thicker above, 2-3 μ , smooth; pedicel very short or lacking.

On *Tripsacum lanceolatum* Rupr., near City of Mexico, Mexico, October 1, 1896, II, *Holway* (type of *Uredo pallida*); Tizapan, near City of Mexico, Mexico, September 27, 1899, II, *Holway* 3504.

On *Tripsacum latifolium* Hitchc., Aguacalientes, Dept. Santa Rosa, Guatemala, January 25, 1908, II, iii, *Kellerman* 7802; Jinotepe, Nicaragua, November 3-7, 1911, II, III, *Hitchcock* (phan.) 8720; Volcano of San Salvador, Salvador, November 20-26, 1911, II, *Hitchcock* (phan.) 8947.

On *Zea Mays* L., Naguabo, slope of El Duque, Porto Rico, April 19, 1916, II, *Whetzel & Olive* 440.

The telia of this species have recently been detected by Dr. E. B. Mains and prove to be even more distinctive than the uredinia. They occur in abundance on the Nicaraguan collection and sparingly on the one from Guatemala, both specimens having been communicated by Mrs. Agnes Chase, who found them in the grass collection of the Department of Agriculture. The telia elevate the epidermis slightly, but are readily found on account of the brown coloration of the surrounding cells. They look, however, more like some species of *Phyllachora* than a *Puccinia*. The teliospores themselves are pale brown and translucent. Owing to the firmness of the enveloping tissues and the delicacy of the teliospores a scraped mount usually shows only the upper part of the teliospores, resembling a parenchymatous mass of tissue. Sections are required to reveal the form of the teliospores; they show that the central spores of the sorus are usually three-celled, while the peripheral spores are often one-celled. Generally the two-celled teliospores predominate.

The type collection and the later one from the same region were first reported as on *Tripsacum dactyloides*, but were later found to be on *T. lanceolatum*. Both collections show the characteristic small, pale urediniospores, but they also show much larger, thick-walled urediniospores of another rust, and in the case of one of them a few teliospores also. This association on the same leaves led at one time (Bull. Lab. Hist. Univ. Iowa 5: 174. 1901) to the assumption that only one species was involved (*P. Tripsaci* Diet. & Holw., now referred to *P. Ceanothi* [E. & K.] Arth.), the larger urediniospores being called amphispores.

The urediniospores on *Zea Mays* are somewhat larger than those on *Tripsacum*. But as those on the collection of *Paspalum* from Guatemala, having two-inch-wide leaves resembling those of maize, are intermediate in size, and as no other grass rust is known having such urediniospores, the collection is assumed to belong here, awaiting the discovery of telia on this host. The size of the urediniospores apparently bears a direct relation to the succulency of the host.

***Puccinia imposita* nom. nov.**

Uredo Muhlenbergiae Diet.; Atkinson, Bull. Cornell Univ. 3: 22. 1897. Not *Puccinia Muhlenbergiae* Arth. & Holw. 1902.

II. Uredinia amphigenous on brownish or purplish spots, early or somewhat tardily naked, cinnamon-brown; urediniospores globoid or broadly ellipsoid, 23–32 by 27–35 μ ; wall cinnamon-brown, rather thick, 1.5–2.5 μ , closely and finely echinulate, the pores prominent, equatorial, 3 or 4, covered with swollen, hyaline cuticle.

III. Telia disposed similarly to the uredinia, chestnut-brown; teliospores oblong or clavate, 18–26 by 37–48 μ , rounded at both ends or slightly narrowed below, usually not constricted at septum; wall dark chestnut-brown above, lighter below, 1.5–2.5 μ thick, thickened 6–8 μ at apex, sometimes also thickened at one side; pedicel golden-brown, short.

On *Leptoloma cognatum* (Schultes) Chase (*Panicum cognatum* Schultes), Auburn, Lee County, Alabama, August 31, 1890, II, iii, Geo. F. Atkinson 1586 (type); Ellsworth County, Kansas, July 27, 1896, II, iii, C. H. Thompson; Austin, Texas, February 27, 1901, II, W. H. Long, Jr. 82; Austin, Texas, November 10, 1914, II, Lewis & Tharp 41; Stillwater, Oklahoma, July 27, 1915, II, C. D. Learn 128; Austin, Texas, October 29, 1915, II, III, B. C. Tharp. The type collection had the host given as probably *Muhlenbergia diffusa*. The material is scanty and without inflorescence. Its identity was ascertained through the painstaking examination made by Mrs. Agnes Chase. On July 16, 1915, she wrote; "The specimen marked '*Muhlenbergia diffusa*' I make *Leptoloma cognatum*. They have the same texture and ligule, and the little erect bit of firm tissue on either side at the summit of the sheath, where in aged leaves it tears loose from the thin ligule as found in *Leptoloma*." The teliospores were discovered on type material in April, 1911, but it was not until the host was positively identified that the relationship of the rust could be worked out.

***Puccinia Cockerelliana* Bethel, sp. nov.**

O. Pycnia amphigenous, few, 107–128 μ broad.

I. Aecia hypophyllous or caulicolous, in small groups 3 mm. or less across, low cupulate; peridium soon disappearing; peridial cells rhombic, 16–23 by 27–35 μ , the outer wall thick, 6–8 μ , smooth, the inner wall thinner, 2–3 μ , coarsely verrucose; aeciospores angularly globoid, 18–24 by 20–29 μ ; wall nearly or quite colorless, moderately thick, 1.5–2.5 μ , finely and evenly verrucose.

II. Uredinia epiphyllous, intercostal, oblong-linear, 0.5–1

mm. long, cinnamon-brown; urediniospores ellipsoid, 19–26 by 24–32 μ ; wall colorless or nearly so, 1.5–2 μ thick, finely echinulate, the pores obscure, probably scattered.

III. Telia similar to the uredinia, long covered by the epidermis, becoming dehiscent by a longitudinal slit, grayish-black; teliospores not surrounded by stromal hyphae, cylindric or clavate-cylindric, 13–21 by 50–85 μ , rounded or truncate above, tapering to base, the upper cell about one third length of spore, slightly or not constricted at septum; wall chestnut-brown above, paler below, thin, about 1 μ , moderately thickened above, 3–7 μ ; pedicel short, tinted.

On *Thalictrum Fendleri* Engelm., Gunnison County, Colorado, September 2, 1899, I, *E. Bartholomew*; Eldora, Colorado, 9,000 feet alt., July 25, 1910, I, *E. Bethel* (Barth. N. Am. Ured. 616); Eldora, Colorado, June 24, and July 2, 1911, I, *E. Bethel*; Trout Lake, 10,000 feet alt., August 2, 1912, I, *F. D. Kern* 5107; Trimble Springs, nine miles from Durango, Colorado, 7,500 feet alt., August 4, 1912, I, *F. D. Kern* 5303.

On *Festuca Thurberi* Vasey, Eldora, Colorado, 9,000 feet alt., September 17, 1910, III; same, May 20, June 24, July 4 (type), October 7, 1911, III; same, June 30, 1912, III; same, September 19, 1914, III; same, July 22, 1916, III, all collected by *E. Bethel*; same, August 25, 1911, II, *Bethel & Kern*; Fremont Station near Manitou, Colorado, August 25, 1916, II, III, *J. M. Bates* 6486.

As early as 1910 Mr. Bethel wrote in transmitting specimens that these forms of rust on *Thalictrum* and *Festuca*, found growing together and apparently genetically connected, were noticeably different from the forms belonging under *Puccinia Clematidis*. He then transplanted healthy plants of both hosts to his garden in Denver, and the following year began a series of cultures, using both aeciospores and teliospores, which has extended to the present time. Some of the results of these numerous trials have been transmitted to the writer; the publication of a full account of the work, however, is contemplated by Mr. Bethel, who has supplied the name and nearly all the information regarding the species, and it is deemed neither necessary nor courteous to give more than a bare statement in this connection. Mr. Bethel also sent telial culture material several times to the writer, from which only one successful germination of spores was obtained. A culture followed, the result being recorded in a report of cultures for 1915 (*Mycologia* 8: 132. 1916) under the name *Puccinia Agropyri*.

Puccinia Cockerelliana is conspicuously different in both gross and microscopic appearance from *P. Agropyri*, which occurs on the same and other similar hosts. The aecia are more crowded, more robust and more inclined to be bullate; the aeciopores are larger and have much thicker walls. The telia are on the rough or morphologically upper side of the leaf and situated between the veins, instead of on the smooth side of the leaf or on sheaths and stems as in *P. Agropyri*. The telia are also larger, and become normally dehiscent and uncovered after a time. The teliospores are very long and slender, and have no enveloping stromal mass, as commonly found in strictly subepidermal forms.

The species is named by Mr. Bethel in recognition of the eminent services rendered science in many fields by Professor T. D. A. Cockerell, of the University of Colorado, Boulder, Colorado, and especially to recall his help in studying the flora of Colorado, including the rusts and other fungi.

***Puccinia inclita* sp. nov.**

II. Uredinia amphigenous, tardily naked, brownish-yellow; urediniospores globoid or ellipsoid, 22–26 by 24–32 μ ; wall pale yellow or brownish-yellow, thin, 1–2 μ , coarsely and sparsely echinulate with elongated and sharply pointed projections, the pores obscure, doubtless 3 and approximately equatorial.

III. Telia similar to the uredinia, chocolate-brown; teliospores broadly ellipsoid or oblong, 26–29 by 35–40 μ , rounded at both ends, very slightly or not constricted at septum, often with mesospores intermixed, 23–27 by 26–29 μ ; wall chestnut-brown, 2.5–3.5 μ thick in upper cell and somewhat thinner in lower cell, thicker above, 3–6 μ and often slightly lighter in color, smooth; pedicel golden-brown or paler, the diameter uniform, about one and one half times length of spore.

On *Ichnanthus pallens* (Sw.) Munro, Mayagüez, Porto Rico, March 2, 1916, II, *Whetzel & Olive* 396; El Yunque, Porto Rico, April 12, 1916, II, III, *Whetzel & Olive* 397 (type).

On *Oplismenus hirtellus* (L.) R. & S., Las Marias, Porto Rico, July 10, 1915, II, *F. L. Stevens* 8118.

The striking appearance of the urediniospores with their prominent echinulation caused the first collection studied, that by Professor Stevens on *Oplismenus*, to be referred to the South American *Uredo Olyrae* P. Henn. (see *Mycologia* 8: 21. 1916), but

it was afterward placed under *Uredo paspalicola* P. Henn. (see Mycologia 9: 92. 1917). The other two collections, those by Whetzel & Olive on *Ichnanthus*, were placed under *Puccinia substriata* Ellis & Barth. (see Mycologia 9: 73. 1917), a species now considered to include *Uredo paspalicola*. More intimate and extended comparisons, however, have led to the belief that this form should be separated from the widely distributed and variable *P. substriata*. The most characteristic features are the large and usually pale urediniospores, with their thin walls, sparsely covered with spine-like points. The spores were at first thought to be thick-walled (see Mycologia 8: 22. 1916), an error due, as in many other cases, to mistaking the dense ectoplasm of the cell as part of the wall.

***Puccinia Coelopleuri* sp. nov.**

O. Pycnia amphigenous or petiolicolous, crowded in groups 1–2 mm. in diameter, noticeable, subepidermal, globoid, 96–112 μ in diameter; ostiolar filaments short.

II. Uredinia amphigenous; the primary form sometimes petiolicolous, crowded, circinating about the pycnia in round or oblong groups 2–10 mm. long, oblong, 0.5–4 mm. long, early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous, the secondary form scattered over the surface of the leaves unaccompanied by pycnia, oval, 0.2–0.5 mm. long, otherwise like the primary form; urediniospores broadly obovoid or ellipsoid, 22–26 by 27–35 μ ; wall cinnamon-brown, 2–2.5 μ thick, much thicker above, 3–7 μ , moderately echinulate, the pores 3, equatorial, covered by the colorless swollen cuticle.

III. Telia mostly hypophyllous, scattered, oval, 0.2–0.5 mm. long, early naked, somewhat pulverulent, chocolate-brown, ruptured epidermis evident; teliospores cylindric, oblong or oblong-clavate, 15–20 by 37–63 μ , rounded at both ends, or slightly narrowed below, not or slightly constricted at septum; wall dark cinnamon-brown, thin, 1–2 μ , slightly thickened at apex, 3–4 μ , smooth; pedicel colorless, fragile, short.

On *Coelopleurum Gmelini* (DC.) Ledeb., Juneau, June 20, 1917, No. 355, July 18, 1918, No. 481; Mendenhall, June 24, 1917, No. 366, September 9, 1917, No. 387 (type), August 3, 1918, No. 487; Haines, August 21, 1918, No. 501, all from Alaska, and collected by J. P. Anderson. A conspicuous and, on account of its large spores, a striking species.

***Puccinia parca* sp. nov.**

II. Uredinia hypophyllous, scattered or irregularly grouped, roundish, 0.3–0.6 mm. across, brownish-yellow, pulverulent; urediniospores narrowly ellipsoid or obovoid, 13–16 by 19–26 μ ; wall brownish- or light-yellow, very thin, 1 μ or less, moderately and inconspicuously echinulate, the pores indistinct, 2–4, equatorial or superequatorial.

III. Telia similar but slightly larger than the uredinia, dark cinnamon-brown, pulverulent; teliospores ellipsoid or oblong, 15–19 by 29–42 μ ; wall cinnamon-brown, rather thin, 1–2 μ , thickened into a hemispherical hyaline papilla over the pores, 4–5 μ , smooth; pedicel colorless, one half length of spore or less, fragile.

On *Tiniaria scandens* (L.) Small (*Polygonum scandens* L.), Flatbush, Long Island, New York, October 5, 1889, II, III, *J. L. Zabriskie* 703; Stelton, New Jersey, September 7, 1892, II, III, *Byron D. Halsted* (Seym. & Earle, Econ. Fungi 367, type); Laurel Springs, northwestern North Carolina, September 20, 1904, II, III, *H. H. Hume* 278. As long ago as October, 1905, Professor Holway called the attention of the writer to the peculiarities of the rust issued by Seymour & Earle in their Economic Fungi under the name of *P. mammillata*. Professor Holway pointed out that that species has rough spores and of a different shape from this material. He thought it might be a new species, but later in his North American Uredineae (1: 40) placed it doubtfully under *P. septentrionalis* Juel. *P. septentrionalis* is a boreal species on *Bistorta viviparum*, having its aecia on *Thalictrum alpinum*, and in America has been taken in Alaska and Newfoundland. The rust in question agrees with *P. septentrionalis* in the character of its teliospores, as Professor Holway pointed out in detail, but differs from it in having slightly narrower urediniospores, with thinner walls, of a lighter and more yellowish color. The species is markedly distinct from *P. Polygoni* A. & S., the common rust on the same and related hosts, both in the teliospores and urediniospores. The pores of the urediniospores are difficult to make out, but are usually three and approximately equatorial, while in the more common *P. Polygoni* they are distinct and two in the upper part of the spore.

***Puccinia gentilis* sp. nov.**

II. Uredinia hypophyllous, scattered, round or elliptic, 0.3–0.8 mm. across, pulverulent, cinnamon-brown; urediniospores oblate-spheroid, 23–26 μ broad by 19–24 μ long, or globoid to obovoid, 21–23 by 21–28 μ ; wall dark cinnamon-brown, 1.5–2 μ thick, moderately and strongly echinulate, the pores 2 or 3, subequatorial or approximately equatorial.

III. Telia hypophyllous, similar to the uredinia, becoming pulverulent, blackish-brown; teliospores broadly ellipsoid, 27–32 by 35–45 μ , rounded above and below, not constricted at septum; wall chocolate-brown, thick, 3–5 μ , thickened over the germ-pore into a yellowish umbo, 7–10 μ thick, moderately verrucose with markings uniting into short irregular lines giving a coarsely verrucose appearance; pedicel colorless, with thin walls, 1 μ or less, twice length of spore.

On *Salvia alamosana* Rose, Oaxaca, Mexico, October 21, 1899, II, iii, *E. W. D. Holway* 3699; *Salvia* sp., Oaxaca, Mexico, October 18, 1899, II, III, *E. W. D. Holway* 3666 (type). The species is in many respects similar to *Puccinia mitrata* Syd., but the urediniospores are larger and more prominently echinulate.

***Puccinia prospera* sp. nov.**

II. Uredinia amphigenous, scattered, round, 0.2–0.8 mm. in diameter, pulverulent, cinnamon-brown; urediniospores oblate-spheroid, 25–30 μ broad by 20–23 μ long; wall cinnamon-brown, 1.5 μ thick, moderately and rather strongly echinulate, the pores 2 or 3, subequatorial.

III. Telia hypophyllous, similar to the uredinia, pulverulent, chestnut-brown; teliospores broadly ellipsoid, 27–32 by 35–40 μ , rounded above and below, not constricted at septum; wall chestnut-brown, rather thin, 1–2.5 μ , thickened over the germ-pores, 5–7 μ , obscurely verrucose-rugose; pedicel colorless, fragile, once to once and half length of spore, thin-walled, fragile.

On *Salvia microphylla* H. B. K., Toluca, Mexico, September 17, 1898, II, *E. W. D. Holway* 3136; Pachuca, Mexico, October 5, 1899, II, III, *E. W. D. Holway* 3579 (type). Another species of the *P. mitrata* group, the teliospores being of the same size as those of that species, but with the thickness of wall and its markings like *P. farinacea* Long. The urediniospores also have the size of *P. farinacea*.

***Puccinia massalis* sp. nov.**

O. Pycnia amphigenous and caulicolous, rather conspicuous, subepidermal, 112–120 μ broad.

I. Aecia amphigenous and caulicolous, crowded in irregular groups 2–10 mm. across on the blades, often 6–20 mm. long on the stems, petioles and veins, causing distortion of the host, cylindric, 0.5–0.8 mm. in diameter, 0.5–1 mm. high; peridium with erect margin, erose or somewhat lacerate; peridial cells rhombic, 19–27 by 32–45 μ , the outer wall 7–10 μ thick, smooth, the inner wall 5–10 μ , closely tuberculate; aeciospores ellipsoid, 16–18 by 22–27 μ ; wall colorless, 1.5–2 μ thick, very closely and inconspicuously verrucose.

II. Uredinia amphigenous, scattered, round, 0.8–1.2 mm. in diameter, pulverulent, cinnamon-brown; urediniospores irregularly ellipsoid, obovate or oblong, 18–24 by 27–35 μ ; wall light cinnamon-brown, 1–1.5 μ thick, moderately echinulate, the pores 2, equatorial.

III. Telia similar to the uredinia, pulvinate, chocolate-brown; teliospores ellipsoid, 23–32 by 39–48 μ , rounded above and below, slightly or not constricted at septum; wall dark chestnut-brown, thick, 3–5 μ , thickened and lighter-colored over the germ-pores, 9–10 μ , smooth, the pore of upper cell apical, of lower cell usually half way to hilum or occasionally at septum; pedicel colorless, once to thrice length of spore.

On *Helianthus ciliaris* DC., Las Cruces, New Mexico, October 27, 1892, I, III, *E. O. Wooton*; Ysleta, Texas, February 24, 1914, III, *Arthur & Fromme 5704*; Mesilla Park, New Mexico, October 7, 1914, III, and May 9, 1915, I, *W. A. Archer*; Albuquerque, New Mexico, December, 1914, III, *W. H. Long 5183*; Brazito, New Mexico, June 15, 1915, I, II, III, *W. A. Archer* (type). This is a much more robust species than *Puccinia Helianthi* Schw., to which most of the collections here cited have been referred (*Mycologia* 8: 159. 1916). The aecia are much larger, and cause swelling of the adjacent tissues, even giving the appearance in some cases of being a systemic rust. Both the aeciospores and teliospores have far thicker walls.

***Puccinia involata* Jackson, sp. nov.**

O. Pycnia epiphyllous, gregarious, few, inconspicuous, subepidermal, 115 μ broad.

I. Aecia hypophyllous, solitary or in groups of two or three; peridium lacerate; peridial cells ellipsoid, 14–18 by 27–35 μ , over-

lapping, the wall $3\ \mu$ thick; aeciospores ellipsoid, $16\text{--}23$ by $24\text{--}26\ \mu$; wall $1\text{--}1.5\ \mu$ thick, closely verrucose.

II. Uredinia hypophyllous, scattered, roundish, small, $0.2\text{--}0.4$ mm. across, moderately pulverulent, cinnamon-brown; urediniospores globoid, ellipsoid or obovoid, $20\text{--}26$ by $24\text{--}29\ \mu$; wall cinnamon-brown, $1.5\text{--}2\ \mu$ thick, prominently echinulate, the pores 2, surrounded by an indistinct smooth area, equatorial.

III. Telia hypophyllous or somewhat amphigenous, scattered, roundish, small, $0.1\text{--}0.4$ mm. across, early naked, compact, chestnut-brown; teliospores ellipsoid or obovate, often somewhat irregular, $19\text{--}26$ by $32\text{--}45\ \mu$, obtuse or rounded above, more or less narrowed below, slightly constricted at septum; wall cinnamon-brown, laminate, thin, $1.5\text{--}2.5\ \mu$ thick, much thicker above, $7\text{--}10\ \mu$, with distinct and somewhat paler umbo; pedicel colorless, once to once and a half length of spore, usually breaking away.

On *Verbesina montanoifolia* Robs. & Greenm., Patzcuaro, Mexico, October 16, 1898, ii, III, 3000 (Barth. Fungi Columb. 5055); Morelia, Mexico, October 8, 1899, ii, III, 3592 (Barth. N. Am. Ured. 426); Patzcuaro, Mexico, October 10, 1899, O, I, II, III, 3606-7 (type), all collections by E. W. D. Holway. The species differs from *P. abrupta* Diet. & Holw., which occurs on the same and other species of *Verbesina*, by the strongly obovate teliospores with somewhat narrowed base, paler and thinner walls, and more fragile pedicel. The *Verbesina* rusts have recently been studied by Professor H. S. Jackson, who has separated this form as a new species and supplied the name and diagnosis.

***Uromyces Shearianus* nom. nov.**

Aecidium Atriplicis Shear, Bull. Torrey Club **29**: 453. 1902.

Uromyces Atriplicis Arth. Bull. Torrey Club **45**: 141. 1918.

Not *U. Atriplicis* McAlpine, 1906.

In the preceding number of this series the writer transferred the early specific name of this rust to another genus without noticing that it had already been used in that connection for a wholly unlike rust occurring in Australia. Although regretting the unnecessary synonym I am pleased to have the opportunity to dedicate the species to Dr. C. L. Shear, who first described it, and who has done notable service in many ways in the field of mycology.

***Uredo biporula* sp. nov.**

II. Uredinia hypophyllous, chiefly scattered or somewhat gregarious, orbicular, 0.2–0.3 mm. in diameter, soon naked, pulverulent, dark cinnamon-brown; urediniospores triangular-obovoid, 21–23 by 23–26 μ ; wall dark cinnamon-brown, 1–2 μ thick, moderately and finely echinulate, the pores 2, basal, and close to the hilum.

On *Salvia fulgens* Cav., Amecameca, Mexico, October 31, 1899, E. W. D. Holway 3758. This collection, in which the uredinia are abundant and conspicuous, shows the unique character among *Salvia* rusts of two basal pores in the urediniospores.

***Uredo amicosia* sp. nov.**

II. Uredinia hypophyllous, scattered, bullate, 0.2–0.4 mm. in diameter, opening by a central pore; paraphyses thickly imbricated, the united bases forming a tissue-like lining to the sides of the sorus, the long free ends cylindric or fusiform-cylindric, 10–16 by 67–112 μ , acuminate or acute, the wall colorless, thickened to nearly or quite obliterate the lumen; urediniospores epedicillate, angularly oblong, ellipsoid, or obovoid, 23–34 by 40–60 μ ; wall golden-brown, 2–3 μ thick, sometimes twice as thick at apex, sparsely and strongly echinulate, the pores obscure, possibly 3 or 4 and equatorial.

On *Chrysophyllum Cainito* L., mesas near Mayagüez, Porto Rico, March 29, 1917, H. E. Thomas 264. There are many sapotaceous rusts, but this one on the common star apple of the tropics seems to be different from any heretofore described. The rather conspicuous sori are abundantly scattered over the under side of the leathery leaves. The spores may possibly be catenulate, as no pedicels can be detected, either attached to the spores or at the bottoms of the sori. Two species of *Uredo* have been described on undetermined species of *Chrysophyllum* from Brazil, but both of them have much smaller spores and quite different sori, judging from the descriptions, no specimens having been seen. They are *Uredo chrysophyllicola* P. Henn. (Hedwigia 41: 106. 1902) and *U. Chrysophylli* Sydow (Hedwigia 49: 78. 1909).

***Uredo ignava* sp. nov.**

II. Uredinia amphigenous, numerous on light brown discolored areas, roundish or oblong, 0.2–0.6 mm. across, pulverulent,

cinnamon-brown; paraphyses peripheral, numerous, hyphoid, incurved, 10–13 by 29–45 μ , the wall pale cinnamon-brown or sometimes colorless, 1–1.5 μ thick, frequently thickened 3–5 μ on the convex side; urediniospores obovoid or ellipsoid, 14–19 by 23–27 μ ; wall colorless or pale cinnamon-brown, 1–2 μ thick, moderately echinulate, the pores obscure, probably 4 and equatorial.

On *Bambos vulgaris* Schrad., Santiago de las Vegas, Cuba, January 29, 1916, *J. R. Johnston* 424 (type); Maricao, Porto Rico, March 15, 1916, *Whetzel & Olive* 428, 429; Mayagüez, Porto Rico, March 20, 1916, *Whetzel & Olive* 427.

The rust produces an abundance of pale yellowish sori on both sides of the leaf, but especially beneath, and more or less discolors the tissues. It has been referred to *Uredo paspalicola* (Uredinales of Porto Rico, *Mycologia* 9: 92. 1917; Uredinales of Cuba, *Mem. Torrey Club* 17: 165. 1918), which it much resembles. There are a number of bamboo rusts. The material listed here has been carefully compared with *Puccinia corticioides* Berk. & Br. (Syd. Ured. 1263), *P. Kusanoi* Diet. (Syd. Ured. 1239, 1313, 1373), *P. longicornis* Pat. & Har. (Syd. Ured. 1314), and one other species distributed by Kingo Miyabe as *P. Phragmitis*, all from Japan, and *P. Bambusarum* (P. Henn.) Arth. from South America, as well as *P. Arundinariae* Schw. from North America, all on species of *Arundinaria* or *Bambos* (or *Bambusa* as the generic name is often written). It has also been compared with the descriptions of other species on these hosts.

***Aecidium Clemensae* sp. nov.**

O. Pycnia epiphyllous chiefly, few, crowded opposite the encircling aecia, noticeable, reddish-brown, subepidermal.

I. Aecia hypophyllous, crowded in orbicular groups 3–8 mm. across on much larger slightly discolored spots, cupulate or cylindrical, 0.2–0.4 mm. in diameter; peridium revolute, coarsely lacerate; peridial cells rhomboidal, 32–47 μ long, somewhat overlapping; aeciospores angularly globose or broadly ellipsoid, 19–27 by 24–27 μ ; wall colorless, 1–2 μ thick, moderately and closely verrucose.

On *Cissus incisa* (Nutt.) Des Moulins, Fort Sill, Oklahoma, June 19, 1916, 11931 (type), July 27, 1916, 11931a, both collected by Mrs. Joseph Clemens. This aecial rust is undoubtedly heteroecious. It has some resemblance to the aecia of *Puccinia subnitens*

Diet., but possesses much larger spores. It is a pleasure to have the opportunity to name this rust in honor of an indefatigable and able collector, who has contributed largely to the wealth of material for study in the rusts as well as in many other groups of plants. The material has been secured from many regions during her world-wide travels, and has been most generously placed at the service of students.

***Aecidium Bourreriae* Holway, sp. nov.**

O. Pycnia amphigenous, few in small groups, noticeable, subepidermal, 128–160 μ broad.

I. Aecia hypophyllous, loosely grouped, short-cylindric, 0.2–0.3 mm. in diameter; peridium fragile; peridial cells rhombic in side view, 13–15 by 23–24 μ , slightly overlapping, the outer wall 6–7 μ thick, transversely striate, the inner wall 3.5–4.5 μ thick, closely and rather prominently verrucose; aeciospores globoid or ellipsoid, 19–23 by 23–26 μ ; wall colorless, rather thick, 1.5–2.5 μ , closely and finely verrucose.

On *Bourreria havanensis* Miers, Nassau, New Providence, Bahama Islands, March 2, 1903, *E. W. D. Holway*. Professor Holway distributed this collection under the name here used, but left the publication of the description to some one else.

***Aecidium Chamaecristae* sp. nov.**

Aecidium Cassiae Ellis & Kellerm. Trans. Kans. Acad. Sci. 10: 91, hyponym. 1887. Not *A. Cassiae* Bres. 1891.

O. Pycnia amphigenous, subepidermal, noticeable, in small groups, 70–96 μ in diameter.

I. Aecia amphigenous, loosely grouped upon reddish spots 2–8 mm. across, cupulate, 0.1–0.2 mm. in diameter, short; peridium recurved, erose; peridial cells rhombic or rhomboidal, 16–23 by 26–35 μ , considerably overlapping, the outer wall thick, 9–10 μ , transversely striate, smooth, the inner wall thinner, 4–6 μ , closely verrucose; aeciospores globoid or ellipsoid, 15–19 by 18–25 μ ; wall colorless, thin, 1–1.5 μ , finely and closely verrucose.

On *Chamaecrista fasciculata* (Michx.) Greene (*Cassia fasciculata* Michx.), Manhattan, Kansas, 1886, *W. A. Kellerman* (Ellis & Ev., N. Am. Fungi 1825); Lincoln, Nebraska, May 28, 1902, *John L. Sheldon*; same, May 29, 1902, *George G. Hedgcock*. The species has apparently never been described, and the name long since chosen was already in use when given. The original collection

issued as No. 1825 in Ellis & Everhart's North American Fungi may be accepted as the type. The collections give the host as *Cassia Chamaecrista*, which by some taxonomists is considered to be the same as *C. fasciculata*. The fungus much resembles *Aecidium Torae* P. Henn., occurring on *Cassia Tora* in Ceylon and Africa, but varies in seemingly important ways, particularly in having well-developed pycnia, which are absent in the foreign collections examined.

***Aecidium modestum* sp. nov.**

O. Pycnia caulicolous, inconspicuous, subepidermal, globoid, 160–220 μ in diameter.

I. Aecia caulicolous, in groups 4–10 mm. long, short cylindric, 0.3–0.4 mm. broad; peridium erect, erose or somewhat lacerate; peridial cells seen with difficulty in side view, in face view very irregular in shape, 19–23 by 35–58 μ , the outer wall thin, about 1–1.5 μ , almost smooth, the inner and side walls 2–3 μ thick, closely and prominently verrucose; aeciospores ellipsoid or oblong, 23–26 by 27–32 μ ; wall colorless, 1–1.5 μ thick, finely and closely verrucose.

On *Zephyranthes* sp., near Ixmiquilpan, State of Hidalgo, Mexico, 1905, *Rose, Painter & Rose 8952*. The species differs from *A. Zephyranthis* Shear, also from Mexico, in possessing larger pycnia and aeciospores, and in having more delicate peridial cells.

***Aecidium ingenum* sp. nov.**

O. Pycnia hypophyllous, discoid, inconspicuous, subcuticular, 80–130 μ broad by 40–50 μ high, without ostiolar filaments.

I. Aecia hypophyllous, closely packed in rows, nearly cylindric to tongue-shaped, often confluent; peridium erect, 0.5–0.8 mm. high, very delicate and fragile; peridial cells in radial section narrowly oblong or linear, 10–16 by 32–42 μ , somewhat overlapping, the outer wall 1–2 μ thick, smooth, the inner wall 3–5 μ thick, closely verrucose with slender tubercles; aeciospores globoid or broadly ellipsoid, 13–16 by 16–23 μ ; wall colorless, 2–3 μ thick, half the thickness being due to the close, rather fine and somewhat deciduous tubercles.

On *Picea canadensis* (Mill.) B. S. P., Fish Creek, Wisconsin, June 30, 1913, *J. J. Davis*; Solon Springs, Wisconsin, June 17, 1914, *J. J. Davis*; and Walden, Vermont, June 8, 1917, *C. L. Orton*, communicated by C. R. Orton (type). This is the first

Peridermium on *Picea* having subcuticular pycnia to be found in North America. In Europe one such form is known, which was shown by cultures made in 1916 by Ed. Fischer (Mitt. Nat. Ges. Bern 1916: 131. 1917) to belong to *Pucciniastrum sparsum* (Wint.) Ed. Fisch., on *Arctostaphylos*. The American form doubtless belongs to some species of *Pucciniastrum*, but probably not to *P. sparsum*, as the spores are considerably smaller than in the European form of that species.

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